

REMARKS

Applicants thank the Examiner for acknowledging Applicants' claim to foreign priority, and for indicating that the certified copy of the priority document, European Patent Application No. 00400459.4 dated February 18, 2000, has been made of record in the file.

Applicants thank the Examiner for initialing the references listed on the PTO-1449 submitted with the Information Disclosure Statement filed on February 16, 2001, thereby confirming that the listed references have been considered.

Applicants respectfully request examination of the Formal Drawings, and that the Official Draftsperson includes an initialed PTO-948 with the next Communication from the Patent Office.

Applicants herein editorially amend claims 1-12. The amendments to claims 1-12 conform the claims to U.S. practice, are not made for reasons of patentability, and do not narrow the literal scope of the claims.

Applicants herein add new claims 13-26. The new claims 13-26 are fully supported by the originally filed specification, and add no new matter. Entry and consideration of the new claims 13-26 is respectfully requested.

~~Claims 1-26 are all the claims presently pending in the application.~~

1. Claims 1, 2, 3, 5 and 12 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Takeshi (Japanese Patent No. Heisei 9-237867)(hereinafter JP '867). Applicants respectfully traverse the rejection of claims 1, 2, 3, 5 and 12 for at least the reasons set forth below.

JP '867 discloses, *inter alia*, a module comprised of an antenna element (3) and a high-frequency device (9). Several ground planes (5, 12) are interposed between the antenna element and the high-frequency device. The ground planes have slots (6, 13) that pierce their respective ground planes. *See* Fig. 1 of JP '897. The antenna element and the high-frequency device are coupled together through the ground plane slots via electromagnetic coupling. *See* English translation of JP '867, Detailed Description of the Invention, numbered paragraph 0014.

JP '867 does not teach or suggest, however, a packaged integrated circuit comprising a radio frequency antenna and an integrated circuit die, wherein the radio frequency antenna is a portion of the package of the packaged integrated circuit, as recited in claim 1. Rather, the antenna element (3) is formed on the front face of the first dielectric substrate (2). *See* English translation of JP '867, Detailed Description of the Invention, numbered paragraph 0012, and Fig. 1. There is no teaching or suggestion that the antenna element (3) constitutes a portion of the first dielectric substrate (2). Instead, the antenna element (3) is simply another component that is attached to the first dielectric substrate (2).

Thus, Applicants believe that claim 1 is allowable for at least the reasons discussed above, and further believe that claims 2, 3, 5 and 12 are allowable at least by virtue of their dependency.

With respect to new independent claim 13, JP '867 does not teach or suggest an integrated circuit package comprising a radio frequency antenna and an integrated circuit die, wherein the integrated circuit die is shielded from the radio frequency antenna, and the radio frequency antenna is coupled by a wire to the integrated circuit die, as recited in claim 13. In fact, JP '867 teaches away from the present invention, since JP '867 teaches the use of electromagnetic coupling, instead

of wiring, to route signals from the high-frequency device to the antenna element. *See* English translation of JP '867, Detailed Description of the Invention, numbered paragraph 0014. Moreover, Fig. 3 of JP '867 fails to teach or suggest wire coupled to the antenna element, as recited in claim 13.

Thus, Applicants believe that claim 13 is allowable for at least the reasons set forth above. Applicants further believe that new claims 14-26 are allowable at least by virtue of their dependency from claim 13.

2. Claims 4 and 6-11 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over JP '867 in view of Masahito (Japanese Patent No. Heisei 8-250913)(hereinafter JP '913), Koichi (Japanese Patent No. Showa 63-1818505)(hereinafter JP '505), Houghton et al. (U.S. Patent No. 6,282,095) and Mussler (U.S. Patent No. 4,733,245). Applicants respectfully traverse the rejection of claims 4 and 6-11 for at least the reasons set forth below.

Claims 4 and 6-11 depend from claim 1, and therefore include all the recitations of claim 1 by virtue of their dependency from claim 1.

~~The Examiner acknowledges that JP '867 fails to teach or suggest a radio frequency antenna~~ disposed on a metal frame of a packaged integrated circuit, and further, JP '867 fails to teach or suggest the use of a Ball Grid Array, a Quad Flat Pack or a Small Outline package. *See* page 3 of the Office Action dated December 19, 2001.

JP '913 discloses, *inter alia*, a MMIC package comprising an antenna (203) and an amplifying circuit (202) enclosed in a cavity in a case (204). The case has metal lining the cavity

enclosing the antenna and amplifying circuit. JP '505 discloses, *inter alia*, a S-shaped slot antenna having a cavity resonator. Houghton et al. discloses, *inter alia*, several types of connectors, such as Ball Grid Arrays, for electrically connecting integrated circuits to printed circuit wiring. Finally, Mussler discloses, *inter alia*, a cavity backed slot antenna.

However, the combination of JP '867, JP '913, JP '505, Houghton et al. and Mussler fails to teach or suggest a packaged integrated circuit comprising a radio frequency antenna and an integrated circuit die, wherein the radio frequency antenna is a portion of the package of the packaged integrated circuit, as recited in claim 1. As discussed above, the primary reference JP '867 does not teach or suggest a radio frequency antenna that constitutes a portion of the packaging of a packaged integrated circuit. None of the secondary references overcome the deficiencies of the primary reference JP '867. JP '913 discloses an antenna and an amplifying circuit connected together within the same enclosure (e.g., without shielding). JP '505 and Mussler disclose various slot-type antennas. Houghton et al. discloses various connection devices. However, each secondary reference fails to supply any teaching or suggestion that overcomes the deficiencies of the primary reference.

Thus, Applicants believe that claims 4 and 6-11 are allowable over the combination of JP '867, JP '913, JP '505, Houghton et al. and Mussler for at least the reasons discussed above.

With respect to new independent claim 13, the combination of JP '867, JP '913, JP '505, Houghton et al. and Mussler fails to teach or suggest an integrated circuit package comprising a radio frequency antenna and an integrated circuit die, wherein the integrated circuit die is shielded from the radio frequency antenna, and the radio frequency antenna is coupled by a wire to the

integrated circuit die, as recited in claim 13. As discussed above, the primary reference JP '867 does not teach or suggest several features of the present invention, and actually teaches away from the invention recited in claim 13. None of the secondary references overcome the deficiencies of the primary reference JP '867. JP '913 discloses an antenna coupled to an amplifying circuit via electromagnetic coupling. *See* Fig. 1 and Abstract of JP '913. JP '505 and Mussler disclose various slot-type antennas. Houghton et al. discloses various connection devices. However, each secondary reference fails to supply any teaching or suggestion that overcomes the deficiencies of the primary reference.

Thus, Applicants believe that claim 13 is allowable for at least the reasons set forth above. Applicants further believe that new claims 14-26 are allowable at least by virtue of their dependency from claim 13.

3. Claims 6-8 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over JP '867 in view of JP '505 and Yoshitaka (Japanese Patent No. Heisei 6-085530)(hereinafter JP '530). Applicants respectfully traverse the rejection of claims 6-8 for at least the reasons set forth below.

~~Claims 6-8 depend from claim 1, and therefore include all the recitations of claim 1 by virtue~~
of their dependency from claim 1.

JP '530 discloses, *inter alia*, a diagonally-shaped microstrip antenna arranged on a dielectric layer.

However, the combination of JP '867, JP '505 and JP '530 fails to teach or suggest a packaged integrated circuit comprising a radio frequency antenna and an integrated circuit die,

wherein the radio frequency antenna is a portion of the package of the packaged integrated circuit, as recited in claim 1 and included in claims 6-8 by virtue of their dependency. In JP '867, the antenna element (3) is formed on the front face of the first dielectric substrate (2). *See* English translation of JP '867, Detailed Description of the Invention, numbered paragraph 0012, and Fig. 1. There is no teaching or suggestion that the antenna element (3) constitutes a portion of the first dielectric substrate (2). Instead, the antenna element (3) is simply another component that is attached to the first dielectric substrate (2). JP '505 discloses a cavity-type slot antenna, but there is no teaching or suggestion that this antenna constitutes a portion of the packaging of an integrated circuit. JP '530 discloses a microstrip antenna (13) that is provided on the surface of a substrate (11) but, again, there is no teaching or suggestion that this antenna constitutes a portion of the packaging of an integrated circuit. Thus, each secondary reference fails to supply any teaching or suggestion that overcomes the deficiencies of the primary reference.

Thus, Applicants believe that claims 6-8 are allowable over the combination of JP '867, JP '505 and JP '530 for at least the reasons discussed above.

With respect to new independent claim 13, the combination of JP '867, JP '505 and JP '530 ~~fails to teach or suggest an integrated circuit package comprising a radio frequency antenna and an~~ integrated circuit die, wherein the integrated circuit die is shielded from the radio frequency antenna, and the radio frequency antenna is coupled by a wire to the integrated circuit die, as recited in claim 13. As discussed above, the primary reference JP '867 does not teach or suggest several features of the present invention, and actually teaches away from the invention recited in claim 13. None of the secondary references overcome the deficiencies of the primary reference JP '867. JP '913

discloses an antenna and an amplifying circuit connected together within the same enclosure (e.g., without shielding). JP '505 discloses a cavity-type slot antenna without any additional teaching of connecting the antenna to an integrated circuit die via wiring. JP '530 discloses a microstrip antenna without any additional teaching of connecting the antenna to an integrated circuit die via wiring. Thus, each secondary reference fails to supply any teaching or suggestion that overcomes the deficiencies of the primary reference.


Thus, Applicants believe that claim 13 is allowable for at least the reasons set forth above. Applicants further believe that new claims 14-26 are allowable at least by virtue of their dependency from claim 13.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

Please charge any fees necessary to maintain the pendency of this application, except for the Issue Fee, to our Deposit Account No. 19-4880.

Respectfully submitted,

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APPENDIX

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

The claims are amended as follows:

1. (*Amended*) A packaged integrated circuit [Packaged Integrated Circuit (PIC)], comprising at least one radio frequency component included in an integrated circuit die [Integrated Circuit die (ICD)] being associated with a radio frequency antenna [(RFA)], said integrated circuit die [Integrated Circuit die (ICD)] being included in said packaged integrated circuit, wherein [Packaged Integrated Circuit (PIC) CHARACTERISED IN THAT] said radio frequency antenna comprises a portion of the package of [is also included in] said packaged integrated circuit [Packaged Integrated Circuit package (PIC)] and is excluded from said integrated circuit die [Integrated Circuit die (ICD)].

2. (*Amended*) The packaged integrated circuit [Packaged Integrated Circuit (PIC)] according to claim 1, wherein [CHARACTERISED IN THAT] said packaged integrated circuit comprises [Packaged Integrated Circuit (PIC) includes] an integrated circuit package [Integrated Circuit Package (ICPA)] which houses said at least one radio frequency component and said radio frequency antenna [(RFA)] which comprises [is constituted by] at least one metal object that is a portion of the package [part] of said packaged integrated circuit [Integrated Circuit package].

3. (*Amended*) The packaged integrated circuit [Packaged Integrated Circuit (PIC)] according to claim 2, wherein [CHARACTERISED IN THAT] said radio frequency antenna [(RFA)] is coupled [constituted] by a wire bonding [coupled] to said integrated circuit die [Integrated Circuit die (ICD)].

4. (*Amended*) The packaged integrated circuit [Packaged Integrated Circuit (PIC)] according to claim 2, wherein [CHARACTERISED IN THAT] said radio frequency antenna [(RFA)] is disposed [applied] on a metal lead frame of said integrated circuit package [Integrated Circuit package (ICPA)].

5. (*Amended*) The packaged integrated circuit [Packaged Integrated Circuit (PIC)] according to claim 1, wherein [CHARACTERISED IN THAT] said radio frequency antenna comprises [(RFA) consists of] at least one planar metal pattern separated from a grounded metal plane by an insulating layer.

~~6. (*Amended*) The packaged integrated circuit [Packaged Integrated Circuit (PIC)] according~~
to claim 5, wherein [CHARACTERISED IN THAT] said planar metal pattern is a metal slot-pattern and said insulating layer is a ceramic layer.

7. (*Amended*) The packaged integrated circuit [Packaged Integrated Circuit (PIC)] according to claim 6, wherein [CHARACTERISED IN THAT] said slot pattern comprises [consists of] a first S-shaped slot.

8. (*Amended*) The packaged integrated circuit [Packaged Integrated Circuit (PIC)] according to claim 7, wherein [CHARACTERISED IN THAT] said radio frequency antenna [(RFA)] comprises a second S-shaped slot rotated 90 degrees with regard to said first S-shaped slot.

9. (*Amended*) The packaged integrated circuit [Packaged Integrated Circuit (PIC)] according to claim 1, wherein said integrated circuit package [CHARACTERISED IN THAT said Integrated Circuit package (ICPA)] is a Ball Grid Array package.

10. (*Amended*) The packaged integrated circuit [Packaged Integrated Circuit (PIC)] according to claim 1, wherein said integrated circuit package [CHARACTERISED IN THAT said Integrated Circuit package (ICPA)] is a Quad Flat Pack package.

11. (*Amended*) The packaged integrated circuit [Packaged Integrated Circuit (PIC)] according to claim 1, wherein said integrated circuit [CHARACTERISED IN THAT said Integrated Circuit] package is a Small Outline package.

AMENDMENT UNDER 37 C.F.R. § 1.111
U.S. Appl. No. 09/784,015
~~ATTORNEY-DOCKET-NO. Q62388~~

12. (*Amended*) A radio frequency module comprising [Radio Frequency Module including]
at least one packaged integrated circuit [Packaged Integrated Circuit (PIC)] according to claim 1.

Claims 13-26 are added as new claims.